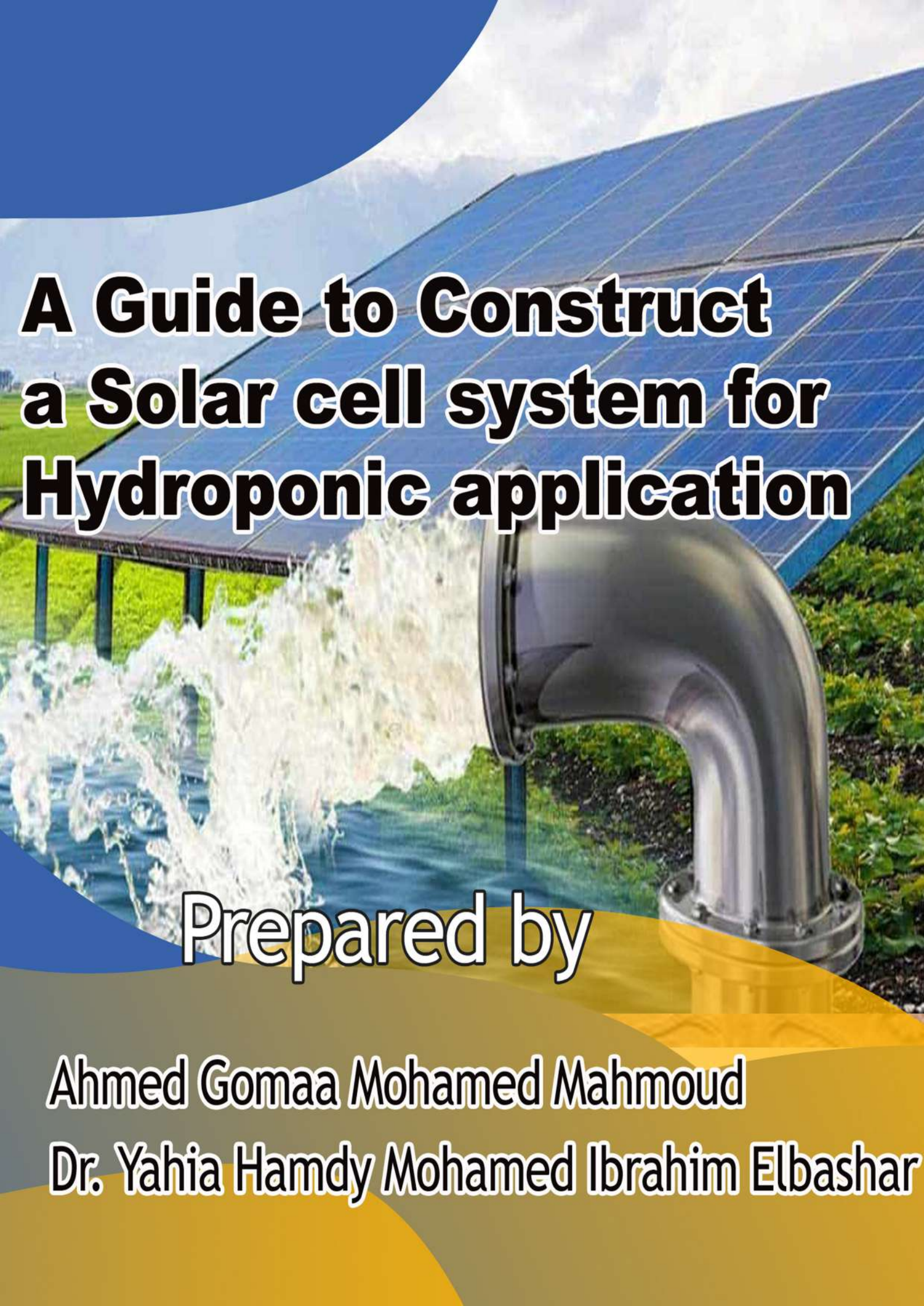




A Guide to Construct a Solar cell system for Hydroponic application

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رقم الإيداع

2023/7774

الترقيم الدولي

ISBN: 978-977-94-5200-5

Objectives

The aim of this work is to use solarcell for Hydroponic application.

Introduction

Growing plants, typically agricultural or medicinal plants, without soil using water-based mineral fertiliser solutions in aqueous solvents is known as hydroponics, a subclass of hydroculture.

Aquatic and terrestrial plants can both thrive with their roots mechanically supported by substrates like perlite or gravel or with their roots exposed to the nutrient-rich waters.

Secondary metabolites in root exudates from transgenic plants cultivated hydroponically can release medicinal proteins into the hydroponic medium, changing the pH of the rhizosphere and the biology and physiological balance of the nutrient solution.

The organic materials that provide the nutrients for hydroponic systems can range widely.

The history of hydroponics

The 1627 publication of Francis Bacon's book *Sylva Sylvarum* or "A Natural History," which was done a year after his death, is the first instance of growing terrestrial plants without soil being documented. His study led to the widespread use of water culture as a research method. John Woodward published the results of his spearmint water culture research in 1699. He discovered that plants grow more effectively in less pure water sources than in purified water.

Nine elements were thought to be necessary for plant growth by 1842, and the discoveries made by German botanists Julius von Sachs and Wilhelm Knop between 1859 and 1875 led to the creation of soilless agriculture. The following is a direct quote from von Sachs: "In the year 1860, I published the results of experiments which demonstrated that land plants are capable of absorbing their nutritive matters out of watery solutions, without the aid of soil, and that it is possible in this way not only to maintain plants alive and growing for a long time, as had long been known, but also to bring about a vigorous increase of their organic substance, and even the production of seed capable of germination." Later, in reference to "soil culture," the growth of terrestrial plants without soil in mineral nutrient solutions was referred to as "solution culture." In the 19th and 20th centuries, it swiftly established itself as an accepted method of study and instruction, and plant nutrition science still makes extensive use of it today. Plant nutritionists began studying plant diseases in the 1930s, and as a result, they began to notice symptoms connected to prevailing soil issues like salinity.

In this situation, water culture experiments were conducted in an effort to reproduce the same symptoms in a lab setting. This strategy, pushed by Dennis Robert Hoagland, resulted in cutting-edge model systems (such the green algae *Nitella*) and standardised nutrient formulations playing a bigger part in contemporary plant physiology. William Frederick Gericke of the University of California, Berkeley, first publicly advocated for the application of solution culture concepts to crop production in 1929. He originally called this cultivation technique "aquiculture," coined as an

analogue to "agriculture," but later discovered that the name was already used to describe the culture of aquatic species. By using mineral nutrient solutions rather than soil to raise tomato vines 25 feet (7.6 metres) high in his backyard, Gericke caused a sensation. When W. A. Setchell, a phycologist with a strong background in the classics, presented the term hydroponics to him in 1937, he used it for the first time. The term "hydroponics" is a neologism that is created from the Greek words "o" (which means "water" and "cultivate") and "geoponica," which means "concerning agriculture," by substituting the prefix "o" for the prefix "earth."

Experimental Tools

Solar cells system construction consists of:

- 1- Solar panel (cell surface) as shown in Figure 1



Figure 1 Solar cell

- 2- Connection wires with different length as shown in Figure 2

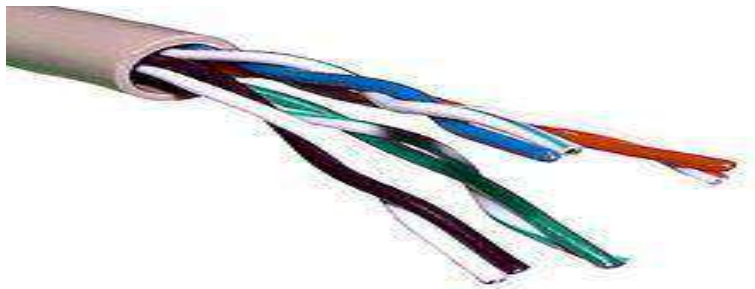


Figure 2 connection cable

3- Inverter device as shown if Figure 3



Figure 3 Inverter device

4- MPPT, or maximum power point tracker is an electronic DC to DC converter that optimizes the match between the solar array (PV panels), and the battery bank, MPPT device (high point of electric power) as shown in Figure 4

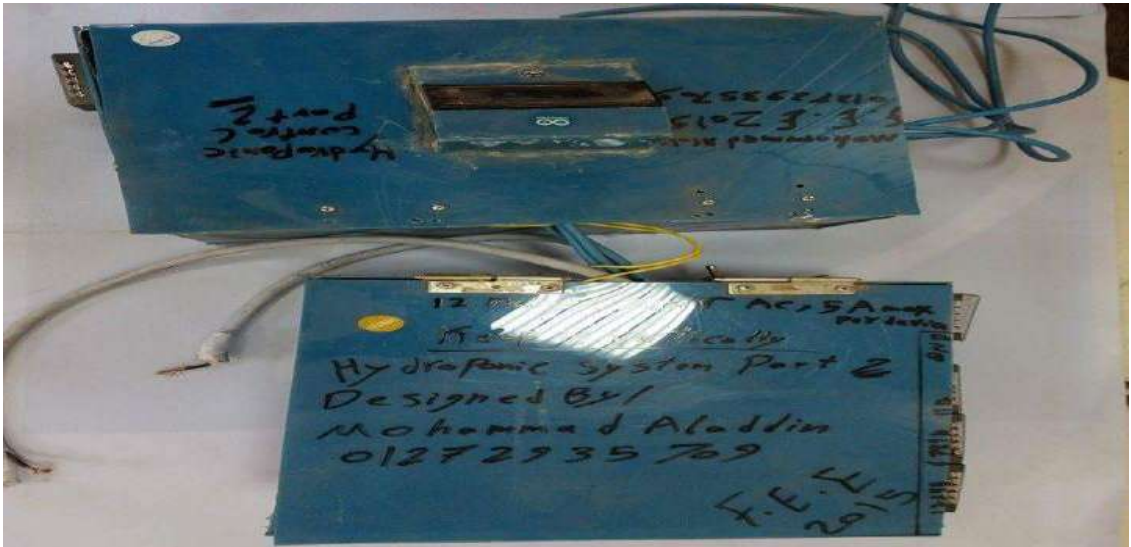


Figure 4 MPPT device

5- Control system

6- Battery (supply with electric charges) as shown in Figure 5



Figure 5 Battery

Hydroponic system construction consists of:

- 1- Greenhouse: A greenhouse, sometimes known as a glasshouse or a hothouse if it has enough heating, is a building with walls and a roof primarily constructed of transparent material, such as glass, where plants that need controlled climatic conditions are produced. These buildings come in a variety of sizes, from modest sheds to enormous factories. A cold frame can be thought of as a tiny greenhouse. When a greenhouse is exposed to sunshine, the interior temperature rises significantly above the ambient temperature, insulating the contents from cold weather as shown in Figure 6.



Figure 6 the Greenhouse

- 2- Control Room: One type of equipment room designed to safeguard inverters, batteries, control panels, switchgears, and other crucial

pieces of equipment in solar power plants and solar parks is the solar inverter/control room. Prefabricated inverter / solar control rooms are an intelligent, quick method to grow with countless possibilities and personalised floor plan & design alternatives. These modular control rooms are constructed of insulated sandwich panels, which aid in maintaining the equipment's necessary temperature. These portable or mounted prefabricated solar inverter rooms are available. Pre-engineered or prefabricated control rooms are adequately constructed to resist difficult climatic conditions and protect sophisticated, expensive equipment from moisture, air, and dust by taking wind speed, seismic zone, and equipment loads into account.

Experimental Method

1-Bring solar cell then, join it to column to put the cell in high position to the sun as shown in Figure 7 and 8.

2-Measure the angle of the solar, it should be 25south east to the sun, this to get a big quantity of heat from the sun, this angle for Egypt Aswan that as every region have special angle as shown in Figure9.

3-The output is DC current from solar.

4-Connect the inverter, this inverter is using to convert DC current of solar cell to AC current.

5-Connect the MPPT, this device used for getting top point of power, preventing current to walk in the opposite direction.

6-Connect the Battery, this device using for supplying devices by electric charges and storing charges.

7-Connect control system, this device using for controlling the power that we give to the greenhouse.

8-Connect the water Pumps to Rise Water to plants as shown in Figure 10.

9- Construct and build the controller room for putting devices for solar cell

10- Connect wires of Inverter to the control system then, and put the control system near to the greenhouse to control the quantity of power we get to the crops, so we should to keep that wires(from Inverter to control system) so,

we put it intubes underground as shown in Figure 11.



Figure 7



Figure 8



Figure 9

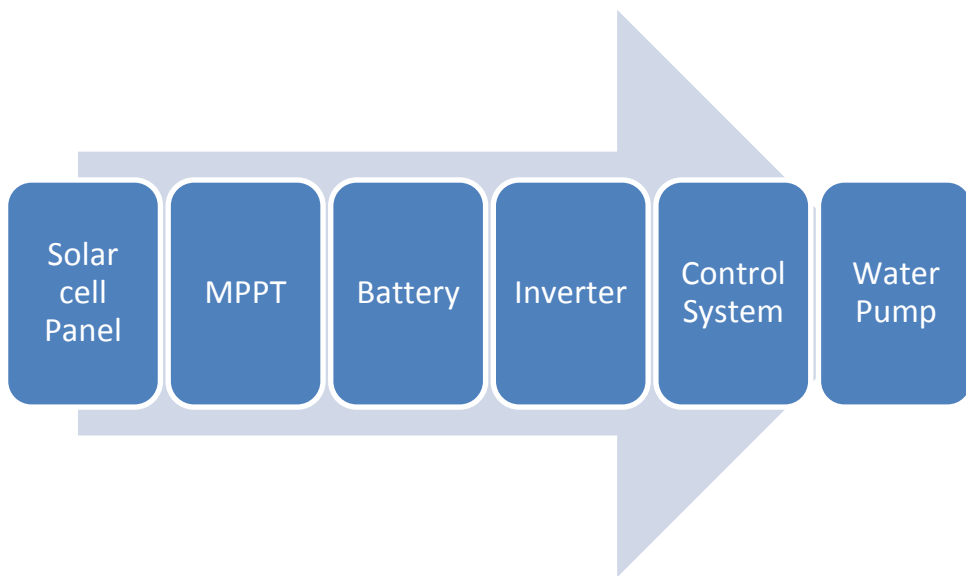


Figure 10

11- Connect devices to each other, and wire from the solar to MPPT.

12-Connect MPPT to Battery.

13 Connect Battery to Inverter. As shown in Figure 12

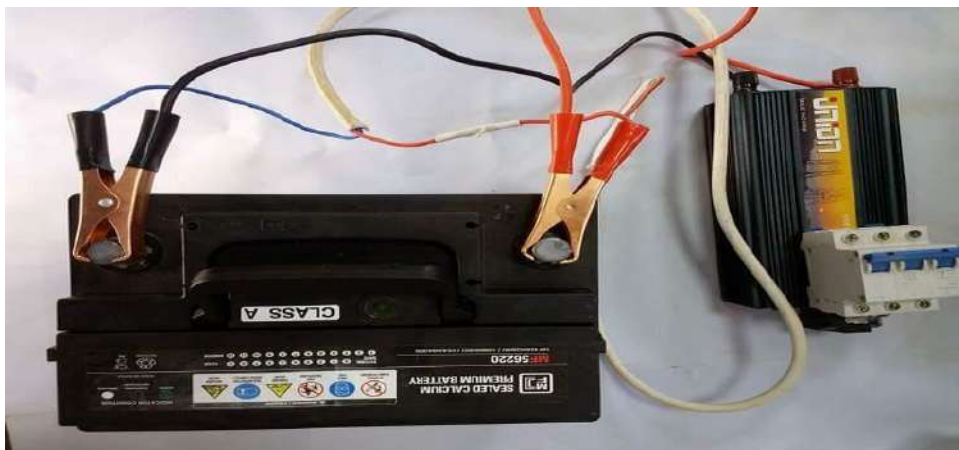


Figure 11



Figure 12

14-Connect wire from the Inverter to Control System, the pumps we need to operate as shown in Figure 13 and 14.

15- Connect wire from Control System (Inverter) to Pumpsto Rise water to plants which, pumps Rise water to pyramidal Design of plants: water Rise to first Row then, put down to second Row then. put down to third Row then, put down to Pump again then, it makes another process(Continue Circle).



Figure 13



Figure 14

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